Clouds and the Earth's Radiant Energy System (CERES)

Data Management System

Configuration Management Plan

Release 1
Version 1

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Preface

The Clouds and the Earth's Radiant Energy System (CERES) Data Management System supports the data processing needs of the CERES Science Team research to increase understanding of the Earth's climate and radiant environment. The CERES Data Management Team works with the CERES Science Team to develop the software necessary to support the science algorithms. This software, being developed to operate at the Langley Distributed Active Archive Center, produces an extensive set of science data products.

The Data Management System consists of 12 subsystems; each subsystem represents a stand-alone executable program. Each subsystem executes when all of its required input data sets are available and produces one or more archival science products.

The documentation for each subsystem describes the software design at various significant milestones and includes items such as Software Requirements Documents, Data Products Catalogs, Software Design Documents, Software Test Plans, and User's Guides.

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1.0 Introduction

The Clouds and the Earth's Radiant Energy System (CERES) is a key component of the Earth Observing System (EOS). The CERES instruments are improved models of the Earth Radiation Budget Experiment (ERBE) scanner instruments which operated from 1984 through 1990 on the National Aeronautics and Space Administration's (NASA) Earth Radiation Budget Satellite (ERBS) and on the National Oceanic and Atmospheric Administration's (NOAA) operational weather satellites NOAA-9 and NOAA-10. The strategy of flying instruments on Sun-synchronous, polar orbiting satellites, such as NOAA-9 and NOAA-10, simultaneously with instruments on satellites that have precessing orbits in lower inclinations, such as ERBS, was successfully developed in ERBE to reduce time sampling errors. CERES will continue that strategy by flying instruments on the polar orbiting EOS platforms simultaneously with an instrument on the Tropical Rainfall Measuring Mission (TRMM) spacecraft which has an orbital inclination of 35 degrees. In addition, to reduce the uncertainty in data interpretation and to improve the consistency between the cloud parameters and the radiation fields, CERES will include cloud imager data and other atmospheric parameters. The first CERES instrument is scheduled to be launched on the TRMM spacecraft in 1997. Additional CERES instruments will fly on the EOS-AM platforms, the first of which is scheduled for launch in 1998, and on the EOS-PM platforms, the first of which is scheduled for launch in 2000.

The CERES team is developing a Data Management System (DMS) to process data from the CERES instruments and produce science data products which will be archived as part of the EOS program. The purpose of this Configuration Management (CM) Plan is to define configuration management policies and procedures to help manage the development of the DMS. The plan includes the following objectives:

      a)   identify and maintain a configuration system for the CERES DMS

      b)   maintain control of changes including performance, cost, and schedule impact

      c)   maintain status accounting and traceability of changes

      d)   verify implementation of all changes

The CM policies and procedures will be used for all the CERES data management documents, source code, and ancillary files for each phase of the software development life cycle.

The NASA Software Management and Assurance Plan (SMAP) Information System Life-Cycle and Documentation Standards, the Institute of Electrical and Electronics Engineers, Inc. (IEEE) standards for Software Configuration Management Plans, and the IEEE Guide to Software Configuration Management (References 1, 2, and 3) were used in the development of this Plan. This CM Plan contains the following sections:

      •   Introduction (Section 1.0) introduces the CM Plan.

- Organization, Responsibilities, and Implementation Schedules (Section 2.0) describes the organizational structure of the project, responsibilities of configuration management personnel, and implementation milestones.

- Configuration Management Process and Policy Overview (Section 3.0) describes general CM processes and policies as related to the CERES DMS.

- Configuration Control Activities (Section 4.0) describes the configuration item baselines for each life cycle phase. This section also describes the activities which control changes to baselined products.

- Support Environment Resources (Section 5.0) provides a description of the CM environment including personnel, hardware, software, and tools.

2.0 Organization, Responsibilities, and Implementation Schedules

The following subsections describe the organizational structure that influences the CM of the software, the responsibilities of the CM personnel and the configuration control board, and implementation milestones.

2.1 Organization

The CERES Data Management Team (DMT) leader and other Data Management Office (DMO) personnel in the Atmospheric Sciences Division at NASA Langley Research Center (LaRC) are ultimately responsible for the development and configuration management of CERES DMS documentation and software. Currently, the development of CERES DMS documentation and software is supported by two government contractors, Lockheed Engineering and Sciences Company (LESC) and Science Applications International Corporation (SAIC). The CERES DMS is composed of twelve subsystems. The development of each subsystem is overseen by a subsystem working group comprised of DMT and CERES Science Team personnel. Each subsystem has contractor and DMO personnel working on the development effort.   Since CERES is a component of EOS, the CERES DMT will need to work closely with the EOS Data Information System (EOSDIS) Distributed Active Archive Center (DAAC) at NASA LaRC. While CERES will maintain CM procedures for the development of CERES documentation and software, some degree of compatibility will be sought with the DAAC. Documentation and software will be delivered to the DAAC for production processing and management within the EOSDIS framework.

2.2 Responsibilities

The CM team is responsible for performing the following tasks:

    a) Implementation and maintenance of the CM Plan

    b) Establishment of naming conventions

    c) Configuration Item Identification

    d) Establishment and maintenance of baselines

    e) Participation in the Configuration Control Board

    f) Participation in reviews

    g) Configuration control

    h) Status Accounting

2.2.1 Implementation and Maintenance of the CM Plan

The CM team is responsible for the implementation and maintenance of the Plan, upon approval by the DMT leader.

2.2.2 Establishment of Naming Conventions

The CM team is responsible for devising and enforcing naming conventions for all CERES documentation and software.

2.2.3 Configuration Item Identification

Configuration item identification applies to all software and associated documentation. The CM team originates the identification scheme, with the approval of the Configuration Control Board. Configuration identification of computer programs and documentation during the development effort consists of established baselines and releases that are time-phased to the development schedules.

2.2.4 Baselines

The CM team is responsible for the establishment of baselines for the control of changes. These baselines are time-phased to the CERES development schedules. The CM team maintains the initial baseline and any changes to that baseline.

2.2.5 Configuration Control Board (CCB)

The CCB is established by the DMT leader, who is the CCB chairperson. Although the CCB chairperson has the final responsibility for CCB actions, the purpose of the board is to promote understanding of policies, procedures, and proposed changes across the entire DMT. The CCB includes subsystem leads, CM personnel, testing personnel, system engineers, and DAAC personnel. The CCB meets on a regular basis to review proposed changes to any CERES documentation or software and to reach a consensus on their disposition.

2.2.6 Reviews

A member of the CM team will participate in the formal review process for the review of system or subsystem documents, code, and procedures. The review process will enable the CM team to learn about each component of the CERES DMS and allow the CM team to verify that approved standards are being followed.

2.2.7 Configuration Control.

All documentation and software entities are released to and maintained by configuration management in a controlled library. The configuration management team administers the change control process.

2.2.8 Status Accounting

A database or similar tool will be used for tracking changes and new releases of all the controlled baselines. The CM team will generate periodic reports for the CERES Project which track the status of requested changes to documentation and software. The CM team will also produce reports which track releases of documentation and software to the DAAC. These status reports will be provided to the DAAC upon request.

2.3 Implementation Schedules

The CM team will begin implementation of the plan as soon as the plan is approved. CM procedures will be phased in as the tools to implement them become available. A complete CM system will be in place prior to the first delivery of code to the DAAC, scheduled for January 1996.

3.0 Configuration Management Process and Policy Overview

The following sections give an overview of the configuration management process and policies that will be applied to the development of the CERES DMS.

3.1 Process Overview

The CM process is designed to provide configuration control of all CERES documentation and software without hindering the development and production process. The overall process allows for the establishment of baselines during Release 1 for documentation and during subsystem testing for software. The change control process begins with a request from the developer to make a change to existing documentation or software. The request is approved or disapproved by the CCB. If the request is approved, changes are made, and the modified documentation or software is released to the CM team. Tracking of baselines and change requests, from submittal through implementation, is done by the CM team. Previous versions of documentation and software will also be maintained. The CM team is responsible for coordinating delivery of updated documentation and software to the DAAC.

3.2 Policy Overview

The following subsections describe policies which will be implemented as part of configuration management.

3.2.1 Product Identification

The following products will be baselined and placed under configuration management:

a) CERES Data Products Catalog

b) CERES Interface Requirements Document

c) CERES Configuration Management Plan

d) CERES Software Test Plan

e) CERES Software Coding Guidelines

f) CERES Operations Document

g) CERES Subsystem Software Requirements Documents

h) CERES Subsystem Software Design Documents

i) CERES Subsystem Data Validation Plans

j) CERES Data Products User's Guides

k) All software developed as part of the CERES Data Management System. This includes subsystem software, utilities, UNIX scripts, makefiles, and other support software written to assist in configuration management or testing.

l) Ancillary files such as parameter files and coefficient files.

m) Subsystem test procedures, test data, and test results.

The above list may not be all inclusive. Other products developed during the life of the CERES Project may be placed under configuration management depending upon the nature of the product.

3.2.2 Product Baselining

All products will complete the CERES formal review process before being baselined. For documents, the final publication version of each document for each release are baselined. Software modules are baselined after completion of unit and component testing but prior to subsystem testing (see Reference 4). Test procedures and test data are baselined prior to testing.

3.2.3 Naming Conventions and Version Identification

Naming conventions for electronic copies of documents and for software will be decided by the CM team during each life cycle phase. The CM team is responsible for notifying the DMT of these conventions. File naming conventions will contain some form of version identification. Each document will contain the release and version number on the cover page. Software, data files, and other ancillary files will contain the version identification within the file.

3.2.4 Standards

Documentation and code will adhere to standards developed by the CERES DMT. The CM team and the CCB are responsible for verifying that these standards are followed or that an exception has been approved.

3.2.5 Product Releases

The CERES Data Management System is being developed through two prelaunch releases. Release 1 provides an initial prototype to test algorithms and procedures. Release 1 software is scheduled to be provided to the DAAC in January 1996. Release 2 represents the flight processing system and is scheduled to be provided to the DAAC in February 1997, six months prior to the TRMM launch in August 1997. A third release is planned for eighteen months after the TRMM launch.

4.0 Configuration Control Activities

The following subsections give details of the configuration control activities for the CERES DMS.

4.1 Configuration Identification

Subsystem baselines will be established for each life cycle phase. Each document will be baselined following the incorporation of changes made during its initial formal review. Changes to each release will be tracked by change request forms and incorporated in the subsequent release. Source code modules, including CERES library and system utility modules, will be baselined prior to the test phase for the first release. Static ancillary input files will also be baselined at this time, along with the Software Test Plan , subsystem-dependent test cases, test data, and test procedures. Each module will be baselined separately. Changes to the established baseline of any configuration item will be made through approved configuration control procedures.

4.2 Configuration Change Control

Configuration change control is effected through the implementation of configuration identification, change control flow and review processes, and status accounting.

4.2.1 Change Control Flow

The following procedures are followed when changing baselined configuration items:

1. The responsible data management team member submits a Software Configuration Change Request (SCCR) to the CM team requesting a change to a configuration item such as documentation, ancillary files, test files, or source code. This change could result from a number of sources such as a bug in the source code, changes in requirements, changes in design, or problems identified in the data product. See Appendix A for a sample SCCR form and an explanation of various fields of the form.

2. The CM team distributes all newly submitted SCCRs to the CCB prior to the CCB meeting.

3. The CCB approves, disapproves, or places the SCCR on hold for further investigation.

4. If the SCCR is approved, the analyst responsible for making the changes obtains a copy of the files requiring modifications from the CM account.

5. The analyst makes only those modifications relevant to the approved SCCR.

6. The analyst performs unit and component testing on any modified source code (see Reference 4).

7. The analyst submits a Software Change Release Form (SCRF) to the CM team. See Appendix B for a sample SCRF and an explanation of various fields of the form.

8. The CM team verifies that the correct version of each file was modified and initiates the move of all modified files. If source code was modified, the CM team will move the files to the testing account where subsystem testing (see Reference 4) will be performed before moving the files to the CM account. Documentation and ancillary files will be moved directly into the CM account unless testing with the ancillary data is required.

9. The CM team coordinates delivery of changed files with the DAAC.

Problems identified by the DAAC in the production environment are documented by a problem report. The CM team will coordinate with the DAAC in defining a mechanism to receive, distribute, and review these problem reports with the appropriate CERES team members. If a change is required, a SCCR is then submitted with a copy of the problem report.

4.2.2 Change Review Process

The CCB meets regularly, generally in conjunction with the CERES Data Management Team meeting, to review and approve, disapprove, or hold for further investigation any SCCRs which have been submitted since the last CCB meeting. The CM team then informs the requestor of the CCB action.The CCB evaluation of an SCCR should consider the following: priorities, compliance to standards, interface issues, impacts on existing documentation and code, resources needed to make the change, and computer resources required for operations.

4.2.3 Acceptance, Storage, and Release Management

A member of the CM team should participate in documentation and software reviews to assure compliance with documentation and software standards. Before accepting new documentation or software, the CM team assures that applicable standards, naming conventions, and version identification are correct. The CM team is responsible for transferring files under configuration control to the appropriate directories. Items under configuration control are stored with read-only permission to the CERES group and to the world. Only the CM team will have write permission to these directories. Previous versions are maintained under configuration control. After acceptance and required testing, the CM team authorizes the release of configuration control items to the DAAC.

4.2.4 Documentation

Software Configuration Change Request (SCCR) forms and Software Change Release Forms (SCRFs) are maintained as a historical record for the CERES Project. Configuration status accounting reports, as described below, are also maintained. These forms and reports are stored in electronic form for the life of the project.

4.3 Configuration Status Accounting

All items under configuration control will be tracked using a database or other CM tool. Reports will be generated as needed. These reports include the following:

a) Listing of all active SCCRs

b) SCCRs sorted by several parameters such as date, subsystem, document, or approval status

c) Cross referencing of SCCRs and SCRFs

d) Listing of products under configuration control and the associated release and version information

e) Summary of products released to the DAAC

5.0 Support Environment Resources

A CM account will be established to hold all controlled electronic files. Subdirectories will be established to easily identify system level documents and software, as well as documents, software, test procedures, data, and results for each subsystem. One of the CERES servers will be used for the CM account. The CM team will deliver files under configuration control to the DAAC, as required. Computer backups will be performed on a regular basis by system administrators to ensure recoverability from a system crash.

5.1 Personnel Resources

CM support will require the most resources during the initial development and testing, and at each launch. A minimum of three persons will comprise the CM team. Due to the variable time required during any life cycle phase, it is expected that each person will devote 25 to 50 percent of their time on CM. A team of three provides for backup personnel during the absence of any member of the CM team. Each of the CM team members should be trained in all CM practices and tools required for the CM process. In addition, the CM team members must be familiar with the CERES software standards; the EOSDIS Core System (ECS) environment; the FORTRAN, C, and Ada computer languages; and UNIX.

5.2 Hardware, Software, and Tools

Each CM team member must be able to access the CM account on the server from a workstation. The operating system must be compatible with the one currently in use at the CERES Science Computing Facility (SCF) and at the DAAC. The following compilers must be available to the CM team:

- FORTRAN 90 (FORTRAN 77 code should be updated to compile under FORTRAN 90)

- ANSI C

- Ada

Commercial tools which support the CM activities are available and will be used as needed.

References

1. NASA Software Management Assurance Program Information System Life-Cycle and Documentation Standards, Release 4.3, March 1989.

2. Institute of Electrical and Electronics Engineers, Inc., Standards for Configuration Management Plans (Std. 828-1983)

3. Institute of Electrical and Electronics Engineers, Inc., Guide to Software Configuration Management (Std. 1042-1987).

4. CERES Software Test Plan, Release 1 (Under Development)

Definitions

Baseline - Establishment of documentation, software, or any other configuration item formally designated at a specific time. Baselines, plus approved changes constitute the current approved configuration identification.

Configuration Control Board - A group of persons that is responsible for approving configuration management activities and changes to configuration control items.

Configuration Change Control - The systematic proposal, justification, evaluation, coordination, and implementation of all approved changes to a configuration item after the establishment of its baseline.

Configuration Item - Software, documentation, data, or any of it
s discrete portions which are designated for configuration control. Configuration items are separately controlled to achieve overall functionality and performance.

Configuration Management - The process of identifying formal configuration control items, controlling changes to items, and reporting the status of these changes.

Configuration Management Team - A group of persons responsible for implementation and maintenance of configuration management.

Status Accounting - The process of providing periodic reports on the status of requested changes.

Abbreviations and Acronyms

ANSI	American National Standards Institute
CCB	Configuration Control Board
CERES	Clouds and the Earth's Radiant Energy System
CM	Configuration Management
DAAC	Distributed Active Archive Center
DMO	Data Management Office
DMS	Data Management System
DMT	Data Management Team
ECS	EOSDIS Core System
EOS	Earth Observing System
EOSDIS	Earth Observing System Data and Information System
ERBE	Earth Radiation Budget Experiment
ERBS	Earth Radiation Budget Satellite
FORTRAN	FORmula TRANslation
IEEE	Institute of Electrical and Electronics Engineers
LaRC	Langley Research Center
LESC	Lockheed Engineering and Sciences Company
NASA	National Aeronautics and Space Administration
NOAA	National Oceanic and Atmospheric Administration
SAIC	Science Applications International Corporation
SCCR	Software Configuration Change Request
SCF	Science Computing Facility
SMAP	Software Management and Assurance Program
SCRF	Software Change Release Form
TRMM	Tropical Rainfall Measuring Mission

Appendix A

Software Configuration Change Request

SOFTWARE CONFIGURATION CHANGE REQUEST		
Subsystem Id : ①	**SCCR Date :**	**SCCR Number :**

Description of Change :

②

Reason for Change :

③

Estimated Man Power : ④

Schedule : ⑤

Impact : ⑥

| **Approval Date :** | **Originator :** ⑦ |
| | **E-mail Address :** ⑧ |

CM-Manager Comments :

Configuration Item Name:	Configuration Item Type:	SCRF Number:
1. ⑨ *2.* *3.* *4.* *5.* *6.* *7.* *8.* *9.*	⑩	

SCCR Key

SCCR information is entered directly into a database through an Informix database form. Following is an explanation of various fields on the form.

<u>SCCR fields to be filled in by analyst (submitter of the SCCR)</u>:

1. **Subsystem Id:** Subsystem identification

2. **Description of Change:** Description of required changes

3. **Reason for Change:** Reason why the changes are required

4. **Estimated Man Power:** Estimate of man-hours required to implement changes

5. **Schedule:** Estimate of when changes will be implemented

6. **Impact:** Any relevant impact on other subsystems, production schedules, work loads, etc.

7. **Originator: Name of person submitting the SCCR

8. **E-mail Address: e-mail address of the person submitting the SCCR

9. **Configuration Item Name:** Name of configuration item (file) requiring change

*10. **Configuration Item Type:** Configuration item type (document, source code, etc.)

*menu selection

**once this information has been entered once, Originator and E-mail Address information can be entered with a single menu selection

<u>SCCR fields to be filled in by CM database or manager</u>:

• **SCCR Date:** Date of SCCR submittal

• **SCCR Number:** Serial number which uniquely identifies each SCCR

• **Approval Date:** Date of SCCR approval

• **CM-Manager Comments:** Optional comments by the CM manager concerning the SCCR disposition, approval, or whatever

• **SCRF Number:** Serial number which uniquely identifies each SCRF

Appendix B

Software Change Release Form

SOFTWARE CHANGE RELEASE FORM

Configuration Item Name: **Configuration Item Number:**

Configuration Item Type:

Configuration Item Directory:

SCRF Number:

SCCR Number:

Subsystem Id:

Destination:
   ①

Account	Move Date:	Move Time:
Test		
Production		
DAAC		

Testing Required: ②
Test Date:

Submitted by: **Submit Date:**
                                           Submit Flag:

SCRF Key

SCRF information is entered directly into a database through an Informix database form. Following is an explanation of various fields on the form.

SCCR fields to be filled in by analyst (submittor of the SCCR):

1. **Destination:** Flag indicating whether configuration item goes to the Test Account, Production Account, or DAAC

2. **Testing Required:** Flag indicating whether testing is required

SCCR fields to be filled in by CM database or manager:

- **Configuration Item Name:** Name of configuration item (file); taken from SCCR form

- **Configuration Item Number:** Serial number which uniquely identifies each configuration item. This number is keyed to Configuration Item Name and Directory.

- **Configuration Item Type:** Configuration item type (document, source code, etc.); taken from SCCR form

- **Configuration Item Directory:** Directory location of configuration item

- **SCRF Number:** Serial number which uniquely identifies each SCRF

- **SCCR Number:** SCCR number; taken from SCCR form

- **Subsystem Id:** Subsystem identification; taken from SCCR form

- **Test Date:** Date of configuration item testing

- **Submitted by:** Name of person submitting the SCRF; taken from SCCR form

- **Submit Date:** Date of SCRF submittal

- **Submit Flag:** Flag indicating whether submittal status of SCRF

- **Test Move Date:** Date of move into the Test Account

- **Test Move Time:** Time of move into the Test Account

- **Production Move Date:** Date of move into the Production Account

- **Production Move Time:** Time of move into the Production Account

- **DAAC Move Date:** Date of movement to the DAAC

- **DAAC Move Time:** Time of movement to the DAAC